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(21) International Application Number: PCT/FI94/00475 (22) International Filing Date: 21 October 1994 (21.10.94) (30) Priority Data: 934685 22 October 1993 (22.10.93) FI (71) Applicant (for all designated States except US): MIKROKIT OY [FI/FI]; Koulukatu 25, FIN-48100 Kotka (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): ILÉN, Tero [FI/FI]; Kalastajankatu 5, FIN-48910 Kotka (FI). (74) Agent: OY KOLSTER AB; Iso Roobertinkatu 23, P.O. Box 148, FIN-00121 Helsinki (FI).		(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
(54) Title: A SYSTEM OF PAYING FOR THE PARKING IN A RESTRICTED AREA BY A PARKING-FEE DEVICE (57) Abstract <p>The system comprises a car-specific parking-fee device (1) which is provided with a device reading a function card or the like and with a wireless data transmission unit (2), and a function card (3) or a similar means of payment that has a secret identification number, and parking-control devices (4, 5, 6) situated at the entrances and exits of a restricted area; the parking-control devices communicating with the car-specific parking-fee device (1) as the car enters and leaves the area, so that the fee to be paid can be determined and the secret identification number of the function card (3) can be checked.</p>		

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A system of paying for the parking in a restricted area by a parking-fee device

5 The invention relates to a system of paying for the parking in a restricted area by a car-specific parking-fee device provided with a device reading a function card or the like and with a wireless data transmission unit, and by a function card or a similar means of payment that has a secret identification number.

10 The Applicant's own Finnish Published Specification 89,753 teaches a parking system where the parking meters found in the street or at the car park gate are replaced by car-specific parking-meters to which parking time is bought in advance. The system is based on function or smart cards into which paid parking time can be loaded at parking-time-distribution points, such as service stations, by paying the necessary fee in advance. Although the device described in FI 89,753

15 flawlessly measures and indicates the parking time charged for, the basis of its operation is that a certain amount of parking time is bought at a certain price for a vehicle by a function card, and the device indicates the parking time still left. However, in some

20 cities multi-storey car parks and parking garages often owned by private companies are preferred to parking places in the street. In such multi-storey car parks, the system mentioned above is not as such the most flexible way of collecting parking fees, since varying

25 ownership and payment systems and the local character of multi-storey car park services make it unlikely for the car parks to commit themselves to a certain system. At present, parking fees are paid at a multi-storey car park either at the cash desk or to an automatic, either

30 in cash or, in more developed systems, by a car-park-

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specific disposable card which is provided with a magnetic tape and in which the starting time of the parking period is stored.

5 The object of the present invention is to apply
a system based on car-specific parking-meters to the
needs of multi-storey car parks or other restricted
parking areas, and to provide a system of paying for the
parking by a parking-fee device, with which the above
10 problems are avoided and which also has some indisput-
able advantages over the other parking-fee systems used
in multi-storey car parks. One embodiment of the system
according to the invention is characterized in that the
system comprises parking-control devices situated at the
entrances and exits of a restricted area, the control
15 devices communicating with the car-specific parking-fee
device as the car enters and leaves the area, so that
the starting and ending time of the parking period and
thereby the fee to be paid can be determined.

20 Another embodiment of the system according to
the invention is characterized in that the system com-
prises parking-control devices situated at the entrances
and exits of a restricted area, the control devices
communicating with the car-specific parking-fee device
as the car enters and leaves the area to check a secret
25 identification number of a card inserted in the parking-
fee device, and preventing the car's exit and/or giving
an alarm if the numbers are not identical upon the
entrance and exit.

30 The system of the invention has notable advantages:

- a simple, generally-applicable method of payment, in which the payment is made from the cardholder's credit card account, or even by the credit card itself,

- stealing of cars from a multi-storey car park becomes essentially more difficult, or can even be prevented altogether,

5 - an effective, safe and rapid entrance and check-out performed by means of the parking-meter of the car and the control system of the multi-storey car park do not require that the driver should leave the car or open the window.

10 The other advantageous embodiments of the invention are characterized by what is stated below in the claims.

15 In the following, the invention will be described in greater detail by means of examples, with reference to the attached drawing, which shows a schematic view of the system of the invention.

20 The system of the invention for paying for the parking in a restricted area comprises a car-specific parking-fee device 1 provided with a device (not shown) reading a function card or the like and with a wireless data transmission unit 2. The system also comprises a function card 3 or the like, and control devices 4,5 at the entrances and exits of a restricted area, including barriers 6 for controlling the entrance to and exit from the car park.

25 A 'restricted area' is here a multi-storey car park, a parking garage, or any other parking area for paid parking which cannot be entered without passing the control point at the entrance gate. At both the entrance and the exit, which are usually separate, there are control devices 4 including barriers 6 communicating with the car-specific parking-fee devices; both the control devices and the barriers are connected to the control centre 4. The control centre collects the parking data about all the cars that have entered the area and may directly operate as a payment terminal in

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relation to the bank or other creditor. For the sake of clarity, only one barrier is indicated in the drawing.

5 A 'function card' is here a card from which information can be read into a parking-fee device via a card-reading device. It may be a processor card in which is stored the card holder's credit card data, or it may be an ordinary credit card or a so-called prepaid card. The essential feature is that the card has a secret, personal identification number (PIN), which is 10 in principle known only to the card holder, and without which the card cannot be used in a parking-fee device. As usual, the system described in the invention may allow three attempts to key the PIN in the parking-fee device, before it switches the device off e.g. for a 15 predetermined period of time.

Entering a car park

A car park is entered in such a way that the car is stopped at an entrance gate and the function card 20 3 is inserted in the car-specific parking-fee device 1. The device then instructs the user to key in the PIN. When the correct number has been keyed in, the parking-fee device forwards the number to the control centre 4 via a wireless data transmission link 2,5. The gate 6 25 is then opened, and the car can be driven into the car park and parked normally. No other measures are required at this stage. Both the parking-fee device 1 and the control centre 4 start timing as the gate opens. The timing and/or its starting time can be shown on the 30 display 7 of the parking-fee device. This is not, however, necessary with respect to the invention.

Leaving the car park

35 In leaving the car park, the car is driven in front of a barrier on the exit route. The function card

is inserted in the parking-fee device, which again asks for the PIN. When the PIN has been keyed in and the control device 4 has checked that the card and the PIN are correct, the timing stops, and the parking time and fee are shown on the display 7 of the parking-fee device. The timing system of the parking-fee device makes it possible for the driver to check the parking duration. When the fee has been accepted, e.g. by pressing a key in the parking-fee device, the barrier is lifted and the control device 4 automatically charges the fee to the card holder's credit card account.

Advantageously, the car park control device 4 communicates with the parking-fee device 1 only when the function card 3 is inserted in the parking-fee device. This is to make it sure that the secret identification number of the card is always keyed in the parking-fee device before any transactions are recorded. The communication between the devices can be arranged to start automatically when the function card is inserted in the parking-fee device or when the PIN has been keyed in.

The parking-control devices 4,5 advantageously communicate with the parking-fee device via electromagnetic near-field recognition operating in the microwave area. The advantages of the electromagnetic near-field recognition include good applicability of the components to integration, and insensitivity of signals to obstacles on the signal path, such as parts of the car. The basics of electromagnetic near-field recognition are described e.g. in the publications NL 8,800,367, US 4,940,968 and US 3,740,742. Data transmission means operating in the microwave area are known e.g. from the publication EP 247,612. The near-field recognition is thus known to those skilled in the art, and it is not described in greater detail herein. The

communication may naturally also be effected via an infrared link or a radio link, which as such are well-known. Advantageously, the communication is encrypted e.g. by a so-called DES algorithm, which prevents breaking into the system.

Prevention of theft in the car park

One essential feature of the system according to the invention is that it provides a way of preventing car thefts in a car park. The majority of today's car thefts take place in parking garages, and there is no effective system of preventing them.

The system of the invention provides a simple and effective anti-theft system. The system is based on the car-specific parking-fee device shown in the figure. In this embodiment, the parking-control devices 4,5 at the entrances and exits of the car park communicate with the car-specific parking-fee device 1 in order to check the secret identification number of the card 3 inserted in the parking-fee device, and prevent exit and/or give an alarm if the numbers are not identical upon the entrance and exit.

Advantageously, the parking-control devices 4,5 at the entrances and exits of a car park communicate with the parking-fee device 1 only when the function card 3 is inserted in the parking-fee device, whereby the parking-control devices do not let the car enter or leave before the secret identification number of the card has been keyed in.

In addition, the system advantageously comprises a safety module 9 arranged between the parking-fee device 1 and an electric system 8 of the car. The safety module, which advantageously comprises an EEPROM memory, contains a predetermined key code, which the parking-fee device checks before communicating with the

parking-control device 4 and which is advantageously also forwarded to the control device. The electric system 8 of the car is represented in the figure by the accumulator, but it is to be understood that a safety module and a switching means 11 described below can be connected to any voltage-carrying point in the electric system of the car.

If the safety module or its wires are detached from the car frame 10, electric system 8 of the car, or parking-fee device 1, the electric circuit of the safety module is broken, whereby the memory is erased and the key code is lost. If this happens, neither the authentic nor any other parking-fee device can check the key code, and so it is impossible to leave the car park without breaking through the barrier or setting off an alarm.

This also makes it impossible to 'borrow' the parking-fee device of a car for another car, since the system installed in a vehicle can be arranged to be put into use by an authorization card or the like which stores car-specific identification data in the parking-fee device and safety module. Even a successful deceit then leaves the car-specific identification data and the PIN of the function card used in the deceit in the memory of the parking-control system, and so the holder of the function card and the owner of the car that the 'borrowed' parking-fee device belongs to is easy to trace.

According to one embodiment of the invention, between the parking-fee device and the electric system of the car is arranged a door switch 11 which requires that a function card 3 with the correct PIN should be inserted into the parking-fee device 1 before the car can be started, if the car has been parked using a parking-fee device. In modern cars with computer-controlled operations, it is easy to provide a start-

inhibiting system which is very difficult to pass. Alternatively or in addition, the door switch 11 may start the timer of the parking-fee device as the car door is opened, the timer switching off the parking-fee device in a predetermined time, preventing the car's exit, if a function card 3 with the correct PIN is not inserted in the parking-fee device 1 within said predetermined time. Should this happen, the car or parking-fee device will not be re-activated until the correct function card has been inserted.

It is obvious to one skilled in the art that the different embodiments of the invention are not limited to the above examples but may vary freely within the scope of the attached claims.

Claims

1. A system of paying for the parking in a restricted area by a car-specific parking-fee device (1) provided with a device reading a function card or the like and with a wireless data transmission unit (2), and by a function card (3) or a similar means of payment that has a secret identification number, characterized in that the system comprises parking-control devices (4,5,6) situated at the entrances and exits of a restricted area, the control devices communicating with the car-specific parking-fee device (1) as the car enters and leaves the area, so that the starting and ending time of the parking period and thereby the fee to be paid can be determined.

2. The system according to claim 1, characterized in that the parking-control devices (4,5) situated at the entrances and exits of a restricted area communicate with the parking-fee device (1) only when a function card (3) or the like is inserted in the parking-fee device; and that the parking-control devices do not let a car enter and do not accept payment upon exit until the secret identification number of the card has been keyed in the parking-fee device.

3. The system according to claim 1 or 2, characterized in that the parking-control devices (4,5) situated at the entrances and exits of a restricted area communicate with the parking-fee device (1,2) via electromagnetic near-field recognition operating in the microwave area.

4. The system according to claim 1 or 2, characterized in that the parking-control devices (4,5) situated at the entrances and exits of a

restricted area communicate with the parking-fee device (1,2) via an infrared link.

5 5. The system according to any one of claims 1 to 4, c h a r a c t e r i z e d in that the communication between the parking-control devices (4) and the parking-fee device (1) is encrypted.

10 6. A system of paying for the parking in a restricted area by a car-specific parking-fee device (1) provided with a device reading a function card or the like and with a wireless data transmission unit (2), and
15 by a function card (3) or the like that has a secret identification number, c h a r a c t e r i z e d in that the system comprises parking-control devices (4,5,6) situated at the entrances and exits of a
20 restricted area, the control devices communicating with the car-specific parking-fee device (1) as the car enters and leaves the area to check a secret identification number of a card (3) inserted in the parking-fee device, and preventing the car's exit and/or giving an
25 alarm if the numbers are not identical upon the entrance and exit.

 7. The system according to claim 6, c h a r -
a c t e r i z e d in that the parking-control devices
25 (4,5) situated at the entrances and exits of a restricted area communicate with the parking-fee device (1) only when the function card (3) or the like is inserted in the parking-fee device, whereby the parking-control devices do not let the car enter or leave the area before the secret identification number of the card
30 has been keyed in the parking-fee device.

 8. The system according to claim 6 and 7, c h a r a c t e r i z e d in that the parking-control devices (4,5) at the entrances and exits of a restricted area communicate with the parking-fee device (1,2) via

electromagnetic near-field recognition operating in the microwave area.

5 9. The system according to claim 6 and 7, characterized in that the parking-control devices (4,5) at the entrances and exits of a restricted area communicate with the parking-fee device (1,2) via an infrared link.

10 10. The system according to any one of claims 6 to 9, characterized in that between the parking-fee device (1) and the electric system (8) of the car is arranged a safety module (9) provided with a memory, the module containing a predetermined key code that can be checked by the parking-fee device during each instance of communication with the parking-control
15 devices (4,5).

20 11. The system according to claim 10, characterized in that the memory of the safety module (9) comprises an EEPROM memory which is erased if the electric circuit of the memory is broken due to the memory or its wires being detached from the car frame (10), electric system (8) of the car, or parking-fee device (1).

25 12. The system according to any one of claims 6 to 11, characterized in that between the parking-fee device (1) and the electric system (8) of the car is arranged a door switch (11) which requires that a function card (3) with the correct identification number be inserted into the parking-fee device (1) before the car can be started, if the car has been
30 parked using a parking-fee device.

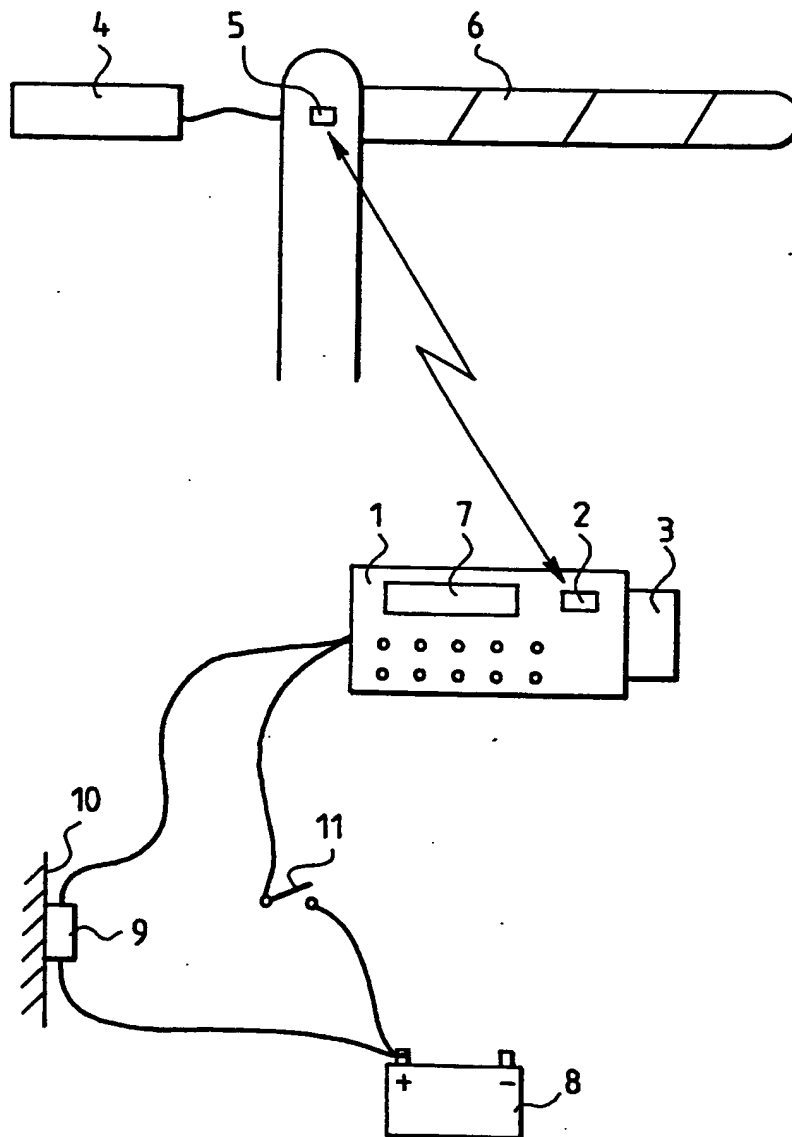
35 13. The system according to any one of claims 6 to 12, characterized in that between the parking-fee device (1) and the electric system (8) of the car is arranged a door switch (11) which starts the timer of the parking-fee device when a door of a car

that has been parked using a parking-fee device is opened, the timer switching off the parking-fee device (1) within a predetermined time, preventing the car's exit from the car park, if a function card (3) with the correct identification number is not inserted in the parking-fee device (1) within said predetermined time.

14. The system according to any one of claims 6 to 13, characterized in that the communication between the parking-control devices (4) and the parking-fee device (1) is encrypted.

15. The system according to any one of claims 10 to 14, characterized in that the system installed in a car is put into use by means of an authorization function card, which stores the car-specific identification data in the parking-fee device (1) and safety module (9).

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 94/00475

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G07C 1/30, G07B 15/02, B60R 25/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G07B, G07C, G08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO, A1, 9015401 (G. HUNTER ET AL.), 13 December 1990 (13.12.90), page 11, line 36 - page 13, line 9 --	1-5
A	FR, A1, 2641635 (A. HECKMANN ET AL.), 13 July 1990 (13.07.90), figure 1, abstract --	1-5
A	WO, A1, 9319435 (MIKROKIT HARDWARE OY), 30 Sept 1993 (30.09.93), figures 1-3, abstract -----	1-5

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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Date of the actual completion of the international search

6 March 1995

Date of mailing of the international search report

07 -03- 1995

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 94/00475

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

One invention in claims 1-5

One invention in claims 6-15

Claim 6 is an independent claim as it does not refer to any of the preceding claims. The characterizing features in claim 6 have nothing to do with paying of the parking-fee. The purpose appears to be prevention of theft of a car in the car park.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.: 1-5

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

09/02/95

International application No.

PCT/FI 94/00475

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 9015401	13/12/90	AU-A- 5721390 EP-A- 0475990 GB-A,B- 2249421	07/01/91 25/03/92 06/05/92
FR-A1- 2641635	13/07/90	NONE	
WO-A1- 9319435	30/09/93	AU-A- 3753193	21/10/93